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[Document Name]Description

[Title of the Invention]Chemicals feeding device

[Claim(s)]

[Claim 1]Housing by which a joint part by the side of an inflow at the one end was provided, and a joint part by the side of an outflow to the other end was provided, and chamber houses were formed in an inside, A flexible tube which both ends were fixed to a joint part by the side of said inflow and an outflow, and has been arranged in said chamber houses, and was formed of a charge of an elastic material and in which expansion contraction is free, A cartridge-like fixed end part which has a pump which supplies a pressurization medium in space between said flexible tube and said housing, and carries out expansion contraction of said flexible tube and to which said flexible tube is attached by said joint part, respectively, It forms by taper part of an inner direction of each of said fixed end part, and a flat part between these taper parts, A chemicals feeding device characterized by a thing form in a crosswise central portion of said flat part a flection which changed into the inner direction or a method of outside, and it was made for said whole flat part of said flexible tube to transform into it with pressure of said pressurization medium.

[Claim 2]A joint part by the side of an inflow, a joint part by the side of an outflow, and a main part of a

pump that has a pump member which is provided among these and has chamber houses inside, and in which expansion contraction is free, A flexible tube which both ends were fixed to joint by the side of said inflow and an outflow, has been arranged in said chamber houses, and formed a pump room between said main parts of a pump, and was formed of a charge of an elastic material and in which expansion contraction is free, A cartridge-like fixed end part which drives said pump member and has a driving means which carries out expansion contraction of said flexible tube via a pressurization medium enclosed in a pump room and to which said flexible tube is attached by said joint part, respectively, It forms by taper part of an inner direction of each of said fixed end part, and a flat part between these taper parts, A chemicals feeding device characterized by a thing form in a crosswise central portion of said flat part a flection which changed into the inner direction or a method of outside, and it was made for said whole flat part of said flexible tube to transform into it with pressure of said pressurization medium.

[Claim 3]A chemicals feeding device projecting, changing and forming in an inner direction or a method of outside by making said flection into a thick part in the chemicals feeding device according to claim 1 or 2.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]Concerning the chemicals feeding device which was made to carry out specified quantity discharge of the fluids, such as a medical fluid, this invention is used in order to apply photoresist liquid to the surface of a semiconductor wafer, and it relates to a suitable chemicals feeding device.

[0002]

[Description of the Prior Art]If it is in the manufacturing process in various technical fields, such as liquid crystal board production technology including semiconductor wafer manufacture art, magnetic-disk production technology, and multilevel interconnection board production technology, Chemicals medical fluids, such as photoresist liquid, SUPINI-on glass liquid, polyimide resin liquid, pure water, a developing solution, an etching solution, and an organic solvent, are used.

[0003]For example, in applying photoresist liquid to the surface of a semiconductor wafer, he is trying to drop photoresist liquid at the surface of a semiconductor wafer by the basis in the state where the semiconductor wafer was rotated in the level surface. As a chemicals feeding device used for the application of such resist liquid, there are some which obtained pumping ability with the tube in which elastic deformation is free, or the bellows-shaped bellows.

[0004]

[Problem to be solved by the invention]As a chemicals feeding device which obtained pumping ability with the bellows, the thing as shown in drawing 7 is developed until now, for example. Drawing 7 (A) shows the chemicals feeding device which guides the medical fluid in the medical fluid tank 73 into the BOMPU room 71, and was made to carry out discharge from the application nozzle 74 by forming the pump room 71 in the outside of the bellows 70, and carrying out expansion contraction of the bellows 70 with the driving rod 72 built into this inside. Thus, when a bellows-shaped bellows performs pump operation of a direct medical fluid. Since the flow of a medical fluid does not occur in the back end side of the bellows 70 but the external surface of the bellows 70 moreover serves as concavo-convex shape, a medical fluid may stagnate in a pump room, and by stay, a medical fluid may deteriorate and it may become a cause of raising dust at the time of an application.

[0005]Drawing 7 (B) forms the flexible tube 75 of the section round shape in which expansion contraction is free, or an ellipse in a part of channel which connects the medical fluid tank 73 and the application nozzle 74, and shows the chemicals feeding device which connected the pressurization room 76 in the cylinder arranged on the outside, and the pump room 71 of the outside of the bellows 70.

[0006]In this case, although stay of the medical fluid in the flexible tube 75 can be prevented, When the flexible tube 75 is made into a section round shape, When pressure was applied in the pressurization room 76, since it was hard to transform the flexible tube 75, it is difficult to set correspondence with pressure and modification as a desired correspondence relation, and it is necessary not only to apply big pressure to this, but was not able to acquire the good pump characteristic. When section shape of the flexible tube 75 is made into an ellipse, as compared with the case of being circular, can change the flexible tube 75 by comparatively little pressure, but. Since it is early to be easy to change the central portion of the tube 75 as compared with both ends, and for the portion with many amounts of modification to deteriorate as compared with other portions, or to damage as a two-dot chain line shows drawing 6 (B), there is a problem that endurance is missing.

[0007]There is the purpose of this invention in improving endurance while improving the pump characteristic of a chemicals feeding device.

[0008]The other purposes and the new feature will become clear from description and the accompanying drawing of this Description along [ said ] this invention.

[0009]

[Means for solving problem]It will be as follows if the outline of a typical thing is briefly explained among the inventions indicated in an application concerned.

[0010]Namely, the housing by which, as for the chemicals feeding device of this invention, the joint part by the side of an inflow at the one end was provided, and the joint part by the side of the outflow to the other end was provided, and chamber houses were formed in the inside, The flexible tube which both ends were fixed to the joint part by the side of said inflow and an outflow, and has been arranged in said chamber houses, and was formed of the charge of an elastic material and in which expansion contraction is free, The cartridge-like fixed end part which has a pump which supplies a pressurization medium in the space between said flexible tube and said housing, and carries out expansion contraction of said flexible tube and to which said flexible tube is attached by said joint part, respectively, It forms by the taper part of the inner direction of each of said fixed end part, and the flat part between these taper parts, The flection which changed into the inner direction or the method of outside is formed in the crosswise central portion of said flat part, and it was made for said whole flat part of said flexible tube to change into it with the pressure of said pressurization medium.

[0011]The main part of a pump which has a pump member which the chemicals feeding device of this invention is formed between the joint part by the side of an inflow, the joint part by the side of an outflow, and these, and has chamber houses inside, and in which expansion contraction is free, The flexible tube which both ends were fixed to the joint by the side of said inflow and an outflow, has been arranged in said chamber houses, and formed the pump room between said main parts of a pump, and was formed of the charge of an elastic material and in which expansion contraction is free, The cartridge-like fixed end part which drives said pump member and has a driving means which carries out expansion contraction of said flexible tube via the pressurization medium enclosed in the pump room and to which said flexible tube is attached by said joint part, respectively, It forms by the taper part of the inner direction of each of said fixed end part, and the flat part between these taper parts, The flection which changed into the inner direction or the method of outside is formed in the crosswise central portion of said flat part, and it was made for said whole flat part of said flexible tube to change into it with the pressure of said pressurization medium.

[0012]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described in detail based on Drawings.

[0013]Drawing 1 is a sectional view showing the chemicals feeding device which is the 1 embodiment of this invention, and the housing 10 of a device has the cylindrical shape-like body part 11 which has chamber houses inside, the joint part 12 by the side of the inflow provided in this one end, and the joint part 13 by the side of the outflow provided in the other end. The supply side channel 14 is connected to

the joint part 12 by the side of an inflow, and this supply side channel 14 is connected to the medical fluid tank 15 as a medical fluid seat part. The outflow side channel 16 is connected to the joint part 13 by the side of an outflow, and this outflow side channel 16 is connected to the application nozzle 17 as a medical fluid discharge part. When applying photoresist liquid to the surface of a semiconductor wafer from the application nozzle 17, photoresist liquid is accommodated in the medical fluid tank 15.

[0014]The supply side opening-and-closing valve 18 for opening and closing this channel is formed in the supply side channel 14, and the outflow side opening-and-closing valve 19 for opening and closing this channel is formed in the outflow side channel 16. As each opening-and-closing valve 18 and 19, the solenoid valve which operates with an electric signal, and the air operation valve which operates by air pressure may be used, and it may be made to use a nonreturn valve, i.e., the Cecchi valve, further.

[0015]Between the joint part 12 by the side of an inflow, and the joint part 13 by the side of an outflow, the flexible tube 21 which was formed of the charge of an elastic material and in which expansion contraction is free makes it located in the chamber houses in the body part 11, and is being fixed.

[0016]When illustrating, [ this flexible tube 21 ] Since the medical fluid supplied is photoresist liquid, it is formed of the tetrafluoro ethylene perfluoroalkylvinyl ether copolymer (PFA) which is a fluoro-resin, and the joint parts 12 and 13 are also formed of the same material so that it may not react to a medical fluid. Although the body part 11 may be formed by the same material, it may form with metal. However, it is not restricted to PFA, but as long as it is the material which carries out elastic deformation, it may be made to use other resin materials also about the flexible tube 21 and the joint parts 12 and 13 as a resin material. It may be made to form the flexible tube 21 and the joint parts 12 and 13 in one.

[0017]The space between the flexible tube 21 and the housing 10 serves as the pressurization room 22, and the incompressible fluid thru/or fluid of a fluid etc. is supplied from the supply port 23 formed in the housing 10 as the pressurization medium M into this. The pump 24 is connected to the supply port 23 by the channel 25 in order to carry out expansion contraction of the flexible tube 21 by carrying out pressurization supply of the pressurization medium M in this pressurization interior of a room, or carrying out suction discharge. When the bellows 28 whose expansion contraction was attained is incorporated with the driving rod 27 in the pump housing 26 and this pump 24 reciprocates the driving rod 27 by driving means, such as an electric motor and an actuator, expansion contraction of the flexible tube 21 is carried out.

[0018]As the pump 24, it is not limited to when illustrating but the thing of various types, such as an AKISHARU pump of the same structure as an oil pressure cylinder etc. and a pump of other types, can be used.

[0019]Drawing 2 is a figure showing the chemicals feeding device which is the 1 embodiment of this

invention, and this chemicals feeding device has the pump part 31 and the pump drive part 32, The pump part 31 is formed of the charge of an elastic material like the case where it is shown in drawing 1, and has the flexible tube 21 in which the elastic expansion contraction to a radial direction is free, and the main part 33 of a pump arranged on this outside.

[0020]The main part 33 of a pump is formed at one between the joint part 34 by the side of an inflow, the joint part 35 by the side of an outflow, and these, and has the pump member 36 which has chamber houses inside and in which expansion contraction is free. Like the case where it is shown in drawing 1, the supply side channel 14 is connected to the joint part 34 by the side of an inflow, and the outflow side channel 16 is connected to the joint part 35 by the side of an outflow.

[0021]On the whole, the pump member 36 has become cylindrical shape-like, and The operation disk part 41 of an axial center, It has the small bellows part 42 which is fabricated by this at one and has the effective diameter  $d$ , and the large-sized bellows part 43 which is united with the small bellows part 42 via the operation disk part 41, and has the bigger effective diameter  $D$  than the effective diameter  $d$  of the small bellows part 42. Here, the effective diameters  $d$  and  $D$  mean the mean bore diameter of each bellows part 42 and 43 in the expansion contraction process of the small bellows part 42 and the large-sized bellows part 43. In the both ends of the main part 33 of a pump, the fixed disk parts 44 and 45 are united, The fixed disk part 44 by the side of the large-sized bellows part 43 is fixed to the joint part 34 by the side of an inflow via the flexible tube 21, and the fixed disk part 45 by the side of the small bellows part 42 is being fixed to the joint part 35 via the flexible tube 21.

[0022]This flexible tube 21 is formed of the same fluoro-resin as the case where it is shown in drawing 1, and is formed of the material as the flexible tube 21 also with the same pump member 36.

[0023]The pump member 36 is attached to the buck 46 in the portion of each fixed disk part 44 and 45, The fixed disk part 44 is attached to the buck 46 with the retaining bracket 47 inserted in this, and the fixed disk part 45 is attached to the buck 46 with the retaining bracket 48 inserted in this.

[0024][ the pump member 36 ] [ by displacing the operation disk part 41 of the axial center in the direction of an axis ] The operation bracket 49 which pump operation was made and was inserted in the operation disk part 41 is connected with the ball screw axis 51 which was prolonged in the buck 46 in parallel with the pump member 36, and was attached to it enabling free rotation at the ball nut 52 by which screw combination was carried out. It is slidably equipped with the ball nut 52 to the guide rail 53 provided in the buck 46, and it is driven in the direction of an axis by rotation of the ball screw axis 51. Since this ball screw axis 51 is rotated, it is equipped with the belt 57 between the pulley 55 fixed to the shaft of the motor 54 attached to the buck 46, and the pulley 56 fixed to the ball screw axis 51.

[0025]The space between the flexible tube 21 and the pump member 36 arranged on this outside serves

as the pump room 58, and the pressurization medium M which consists of incompressible fluid thru/or fluids, such as a fluid, is enclosed in this pump room 58. Therefore, the capacity inside the small bellows part 42 and the large-sized bellows part 43 will change, without the full length of the pump member 36 changing, if elastic deformation of the pump member 36 is carried out in the direction of an axis by the operation disk part 41 of the central portion. By this, via the pressurization medium M, the flexible tube 21 will carry out expansion contraction at a radial direction, i.e., a transverse direction, and will carry out pump operation of the flexible tube 21.

[0026]When illustrating as the pump member 36, as long as it is not restricted but changes mechanical movement of a member into capacity change of the pressurization medium M, what kind of thing may be used.

[0027]When the flexible tube 21 shown in drawing 1 and drawing 2 all has same structure and shows this flexible tube 21, it is as drawing 3 and drawing 4.

[0028]The flexible tube 21 has the fixed end part 21a of the shape of a cylindrical shape attached to both ends at the joint part by the side of an inflow and an outflow, respectively, the taper part 21b is formed inside the longitudinal direction of each fixed end part 21a, and it has become the flat part 21c between each taper part 21b. When the cross section serves as an ellipse mostly on the whole and the flat part 21c is shown in drawing 4, cross section shape serves as a cocoon form. Therefore, as for the crosswise both-sides portion of the flat part 21c, a section serves as mist and a large circular part from a semicircle, and this portion serves as the crushing part 61. And it stood in a row in the crushing part 61 of both sides, and the crosswise central portion by the side of both sides was projected circularly, and was changing into the inner direction, this portion became the flection 62, and that flection 62 is prolonged over the whole flat part 21c along with the longitudinal direction of an axis, i.e., the direction.

[0029]Thus, the taper part 21b is formed inside the both ends of the flexible tube 21, The intensity of the crosswise central portion of the flat part 21c becomes high over a longitudinal direction by making the portion between each taper part 21b into flat shape, and forming the flection 62 projected to the inner direction along with the longitudinal direction in the crosswise central portion. By this, when the flexible tube 21 receives pressurization power from the outside by the medium M, as shown in drawing 4 (C), the crushing part 61 of a crosswise side part changes greatly, and the flection 62 by the side of both sides will change so that it may approach mutually, and will contract the flexible tube 21. In that case, in the whole longitudinal direction, the flection 62 by the side of both sides will change it into it for it, as each portion of a longitudinal direction holds the same interval mutually.

[0030]Therefore, if pressure is applied to the outside of the flexible tube 21 by the pressurization medium M, as a two-dot chain line shows drawing 3 (A), the flection 62 will be displaced, without displacing the specific part of a longitudinal direction intensively so that it may approach mutually on the whole. Thus, since expansion contraction of the flexible tube 21 is attained by modification of the

crushing part 61 and modification of the flection 62, without intensive displacement of a specific part occurring, While the endurance of the flexible tube 21 improves, the correspondence relation of the pressure and the amount of modification of the flexible tube 21 which are applied will have linearity, and the pump characteristic will improve.

[0031]Drawing 5 is a figure showing other embodiments of the flexible tube 21, and the flection 62 of this flexible tube 21 is formed by making it change so that it may project circularly into the crosswise central portion of the flat part 21c.

[0032]Drawing 6 is a figure showing the embodiment of further others of the flexible tube 21, and the flection 62 of this flexible tube 21 is formed by providing a thick part in the crosswise central portion of the flat part 21c mostly formed in the ellipse on the whole.

[0033]As shown in drawing 5 and drawing 6, even if it forms the flection 62, while both flections 62, on the whole, hold the interval in a longitudinal direction uniformly at the time of expansion contraction, It is possible to raise improvement in the pump characteristic and the endurance of the flexible tube 21 like the case where changed so that approach estrangement might be carried out, and it mentions above.

[0034]the case where it illustrates -- respectively -- the flection 62 -- the longitudinal direction of the flat part 21c -- although he is trying to form in the whole mostly, it may be made to form the flection 62 only in the longitudinal direction central portion of the flat part 21c, as a dashed line shows drawing 3 (A)

[0035]As mentioned above, although an invention made by this invention person was concretely explained based on an embodiment, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the aforementioned form and does not deviate from the gist.

[0036]For example, if it is the shape which changes uniformly a both-sides portion in the flat part 21c as shape of the flection 62 covering full length, It is not limited to when illustrating but may be made to form a thick part in a longitudinal direction for every predetermined interval in addition to considering it as shape projected to an inner direction as shown in drawing 4, or shape projected to a method of outside. As cross section shape of a fixed end part, when illustrating, it supposes that it is circular or is good also as the shape of a polygon-like cartridge.

[0037]

[Effect of the Invention]It will be as follows if the effect acquired by the typical thing among the inventions indicated in an application concerned is explained briefly.



[0038](1) Since . flexibility tube was formed by the cartridge-like fixed end part, the taper part of the method of the inside of the longitudinal direction, and the flat part between these taper parts and the flection was provided in the flat part, the specific portion of a flat part is prevented from concentrating and changing.

[0039](2) It can. Come, and can be alike and the endurance of a flexible tube can be raised more.

[0040](3) To the pressure of . and the pressurization medium which carries out expansion contraction of the flexible tube, the amount of expansion contraction of a flexible tube will change linearly, and can raise the pump characteristic.

#### [Brief Description of the Drawings]

[Drawing 1](A) is a sectional view showing the chemicals feeding device which is the 1 embodiment of this invention, and (B) is a sectional view which meets the 1B-1B line in the figure (A).

[Drawing 2]It is a sectional view showing the chemicals feeding device which are other embodiments of this invention.

[Drawing 3](A) is a sectional view showing the flexible tube shown in drawing 1 and drawing 2, (B) is a sectional view which meets the 3B-3B line in the figure (A), and (C) is a top view of the figure (A).

[Drawing 4]A flexible tube cuts (A) in part, it is lacked, and is a perspective view, (B) is a transverse cross section of a flexible tube, and (C) is a transverse cross section showing the state where the flexible tube contracted.

[Drawing 5]The flexible tube which are other embodiments of this invention cuts (A) in part, it is lacked, and is a perspective view, (B) is a transverse cross section of a flexible tube, and (C) is a transverse cross section showing the state where the flexible tube contracted.

[Drawing 6]It is a transverse cross section of the flexible tube which are other embodiments of this invention.

[Drawing 7](A) is a schematic diagram showing the conventional chemicals feeding device, and (B) is a

schematic diagram showing other conventional chemicals feeding devices.

[Explanations of letters or numerals] 10 Housing 11 body-part 12 [ Medical fluid tank 16 / The outflow side channel 17 / Application nozzle 18 / Supply side opening-and-closing valve 19 / The outflow side opening-and-closing valve 21 / Flexible tube 21a. ] Joint part 13 by the side of inflow Joint part 14 by the side of outflow Supply side channel 15 The fixed end part 21b taper part 21c flat part 22. Pressurization room 23 supply-port 24 The pump 25. Channel 26 The pump housing 27 driving rod 28. The bellows 31 pump-part 32 pump-drive part 33. Main part of pump 34 The joint part 35 by the side of an inflow. Joint part 36 by the side of an outflow The pump member 41. The operation disk part 42 small bellows part 43. The large-sized bellows part 44 and 45 fixed disk parts [ Guide rail 54 / Motors 55 and 56 / Pulley 57 / Belt 58 pump-room 61 crushing part 62 / Flection ] 46 The buck 47 and 48 retaining bracket 49 Operation bracket 51 ball-screw axis 52 Ball nut 53

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[Translation done.]